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(56) Documents Cited
GB 2318101 A US 5409256 A US 5354093 A
US 5320379 A

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(54) Abstract Title
Vehicle airbag cushion mounting

(57) In an airbag arrangement the airbag cushion 7 is retained in its housing 2 by a snap fitting frame or ring 1 having a plurality of hooks 3 for holding the periphery of the cushion, which hooks engage with apertures and latches 4 in the housing. The material of the cushion may pass around the lower edge 8 of the frame which fits tightly against the housing to clamp the cushion. The frame and housing may be aluminium, magnesium, alloys thereof or plastic mouldings. The frame may fit into a channel 9 along the upper edge of the housing and the hooks may be retained by resilient tongues 4 above each aperture. Part of the airbag may be folded over the top of the frame to provide a cover 11 for the remainder of the folded airbag, which part may be provided with a perforated tear line 12.

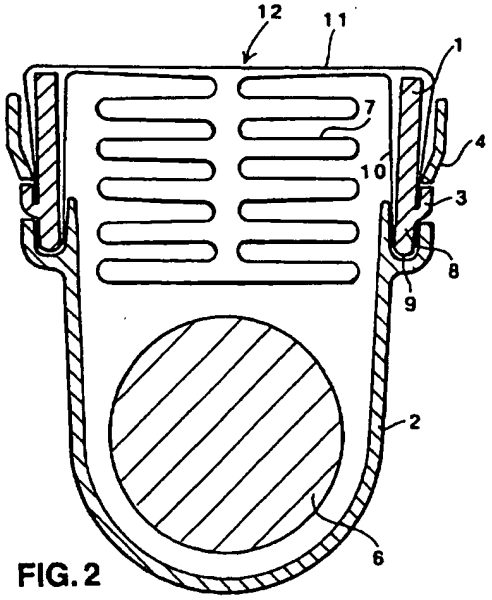

FIG. 2

GB 2 323 572 A

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

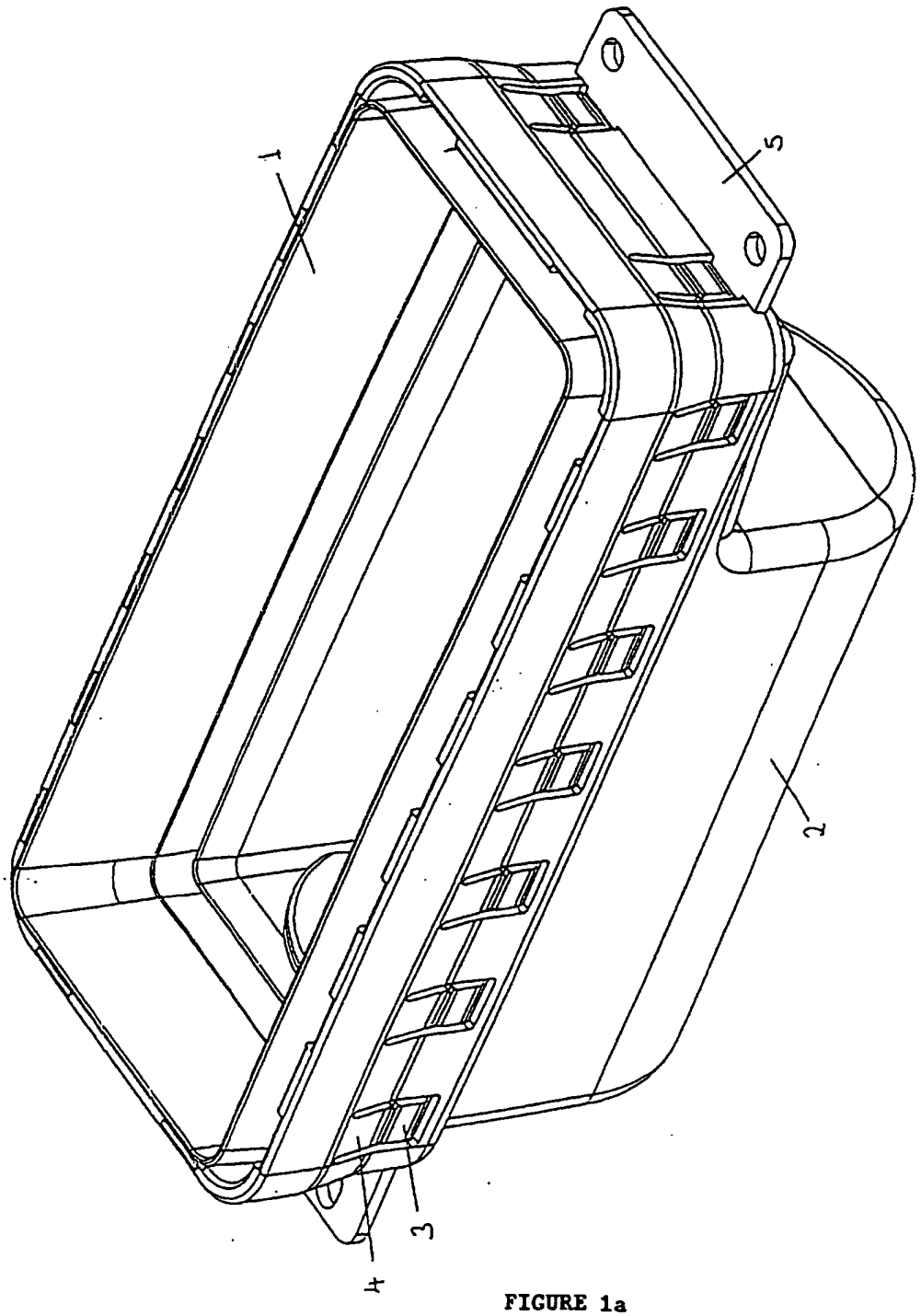

FIGURE 1a

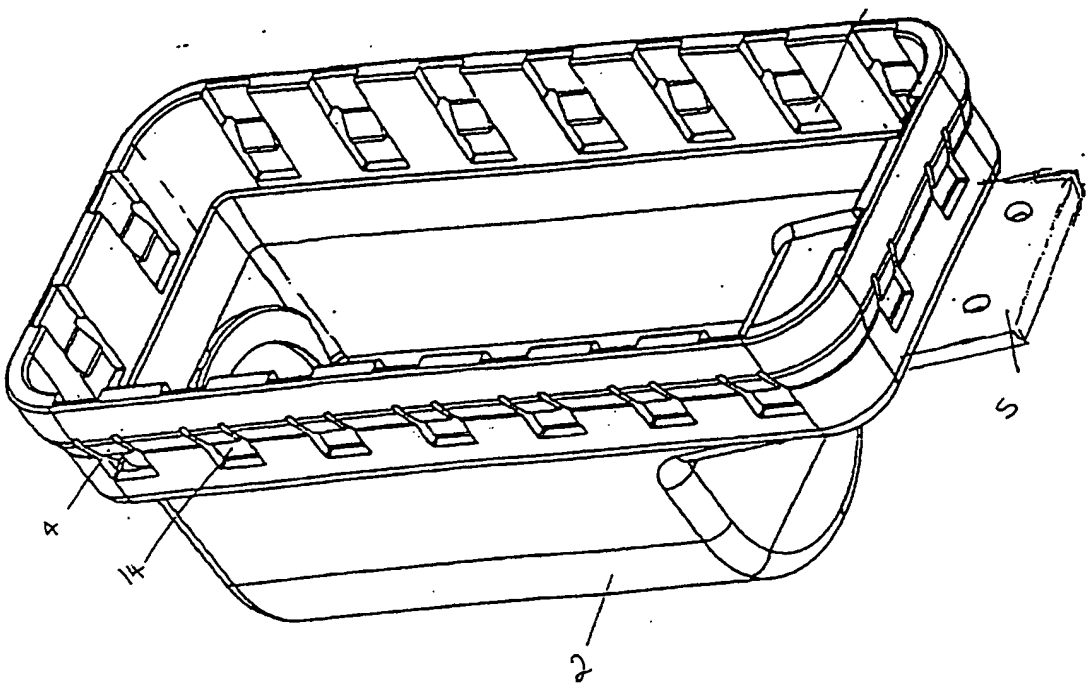

FIGURE 1b

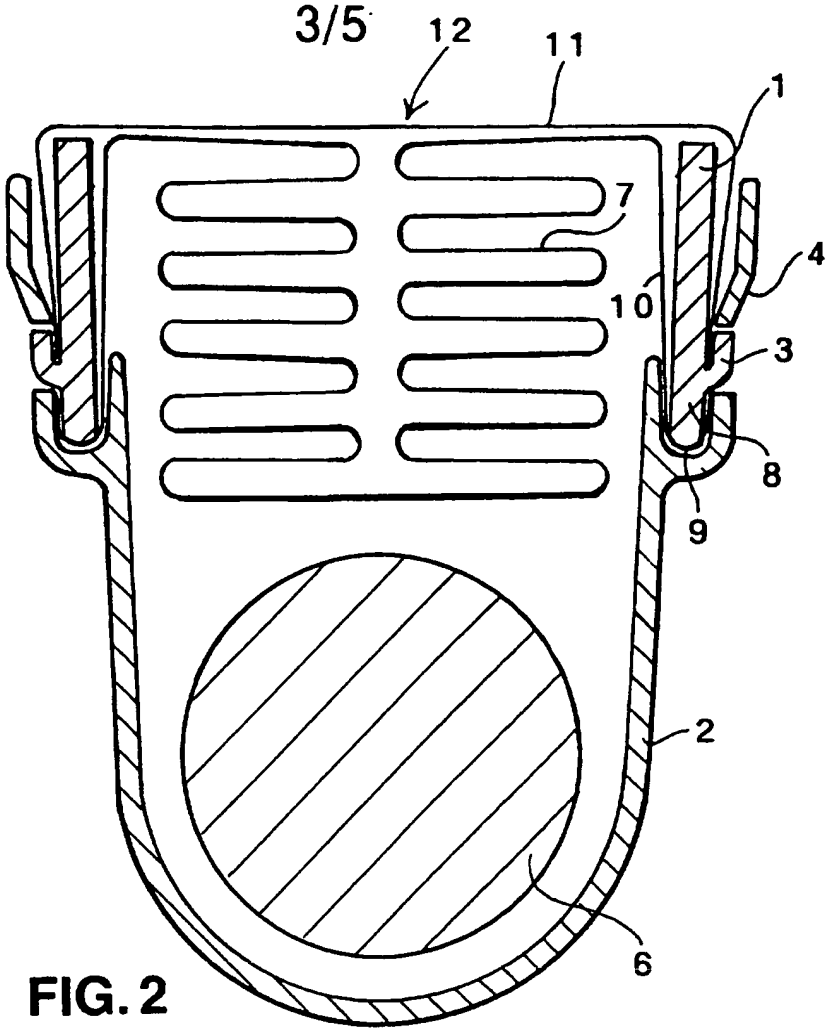

FIG. 2

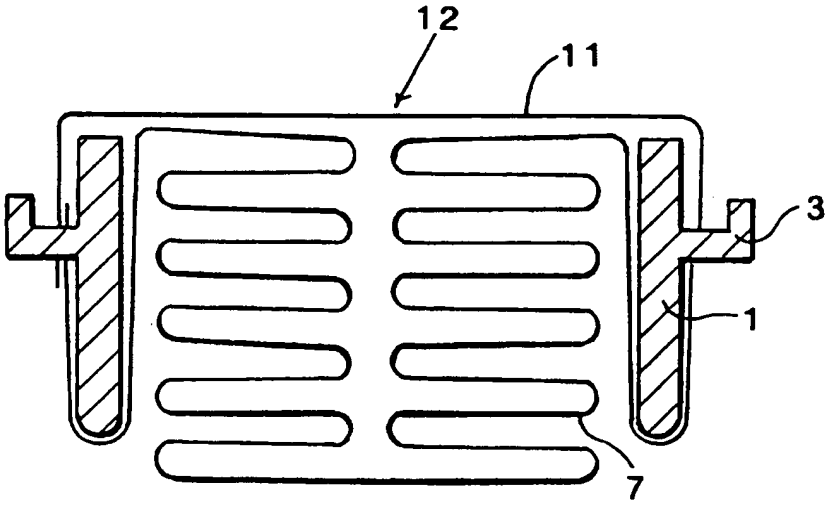

FIG. 4

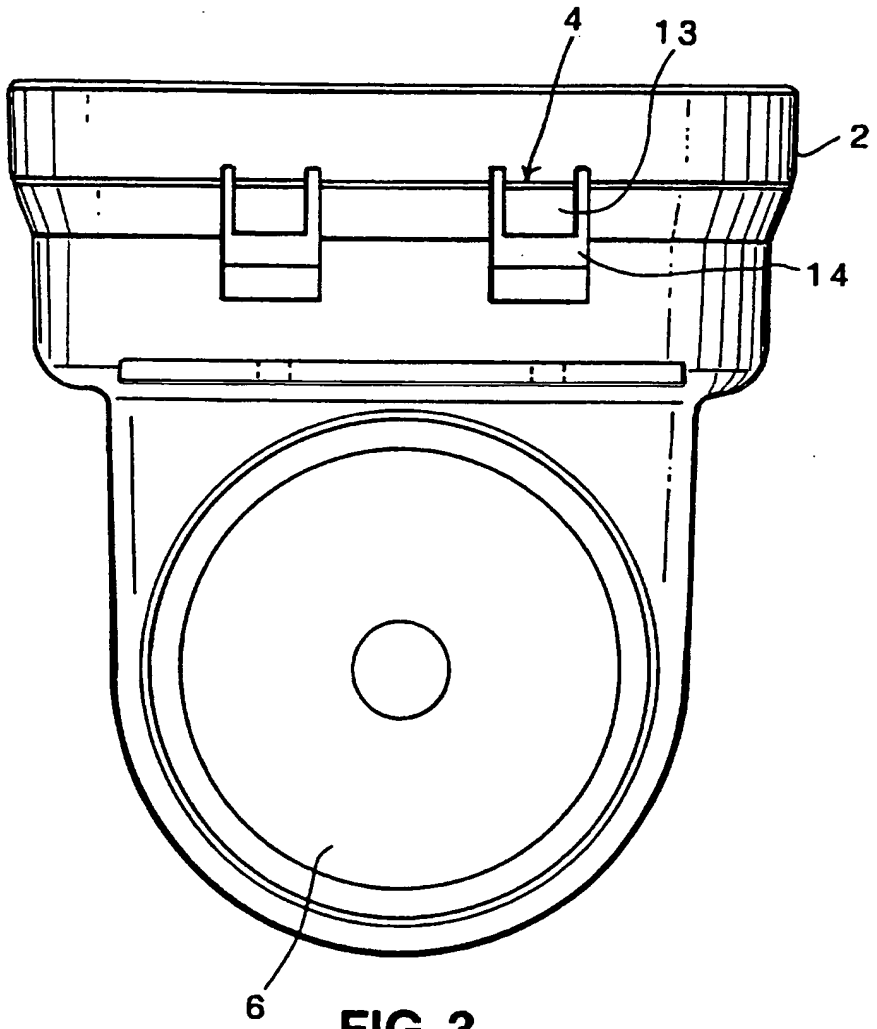

FIG. 3

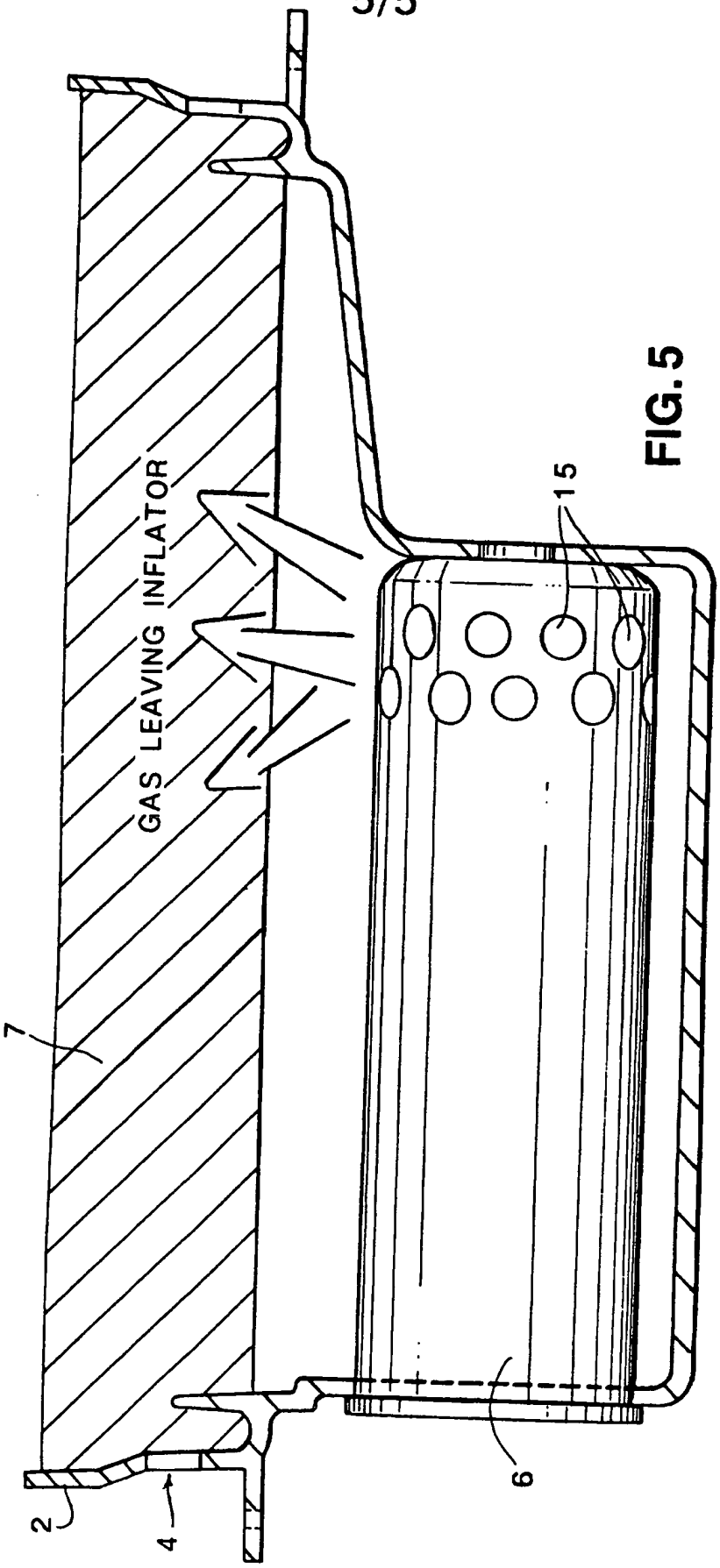

FIG.5

AIRBAG

The present invention relates to an airbag and particularly to an arrangement for mounting an airbag cushion in a housing for connection to an inflator.

Vehicle safety restraints in the form of airbags are well known. They comprise hollow fabric cushions which are inflated when a crash condition is sensed to shield the vehicle occupant from impact with hard parts of the vehicle interior, such as the steering wheel on the driver side or the instrument panel on the passenger side. Airbags to protect against side impacts, e.g. against the vehicle door or side support pillar are also known and the invention applies equally to them.

Traditionally an airbag cushion is folded into a metal support frame or housing and is attached thereto by rivets or bolts about the circumference of a hole which allows for the inlet of inflation gas. An inflator is arranged with its outlet holes in communication with the cushion inlet. The inflator may be either in the form of a cylinder of compressed gas, or in the form of a hybrid inflator with chemicals which eject gas when ignited by a pyrotechnic device. The housing is mounted in the vehicle.

It is important to securely attach the cushion within the housing so as to ensure correct alignment of the inflation inlet with the inflator and to avoid the cushion detaching under the high forces generated. Obviously the fabric of the cushion has a limited tear strength and rivets or bolts impose a local weakness which prejudices this. The

effect can be lessened using clamping rings or retaining members to spread the forces generated. However this is expensive and adds to the weight of the airbag module and the time taken for assembly.

It is an object of the present invention to provide a simpler cheaper form of securement of a airbag cushion into a housing without prejudicing the strength of the attachment.

In accordance with the invention there is provided an airbag housing arrangement for securing an airbag cushion in an airbag housing, comprising a retainer frame having a plurality of externally jutting hooks spaced around its outer side or sides, adapted to hold peripheral edge portions of the airbag cushion, and furthermore at least some of the hooks being adapted for bending the airbag housing on assembly therewith and for snap-fit engagement in correspondingly spaced apertures in the sides of the airbag housing.

Preferably the lower edges of the frame (viewed in the direction of deployment of the cushion) are rounded to present a smooth surface to the airbag fabric. The airbag cushion fabric, in the region of the mounting flap, preferably abuts the inside surface of the frame, turns through 180° as it passes under the lower edge of the frame and abuts the outer surface of the frame, at least up to the position of its engagement with the hook or hooks. In this way undesirable high stress areas on deployment of the airbag cushion are minimised. The friction between the

cushion and the frame distributes the load more evenly over the whole mounting flap and deflects some of the forces away from the hooks themselves. The forces on the hooks are fractionally delayed until the friction forces are taken up, and a substantial part of the force is taken by the housing.

The frame and housing may be made to fit tightly together to clamp the cushion fabric. Preferably however a small clearance is built in to allow for manufacturing tolerances. Under the stress of deployment the cushion is nonetheless effectively clamped because of the inward component of the force on the bottom frame edge when the airbag cushion fabric is stretched out when deployed. In addition, this turning moment will tend to reinforce the engagement of the hooks in the housing apertures. The forces on the cushion are thus transferred to the housing via the frame and the hooks.

The frame, as also the housing, is preferably cast or moulded out of magnesium or aluminium or alloys thereof to keep the weight at a minimum. Plastic moulding could also be used. This is particularly advantageous compared to using plate metal and allows for versatility in the forms, shapes and thickness of retainer frame which can be produced. The housing can then have holes instead of slots to receive the hooks and this makes for a stronger arrangement. In the preferred embodiment the airbag cushion is contained within the sides of the retainer frame which takes the form of a three dimensional moulded piece and surrounds the cushion like a ring.

Many hooks are preferable, for example 18 are used in the specific embodiment described later.

In assembling an airbag module incorporating this design, the airbag cushion is attached via the hooks and folded into the frame.

Then the frame is slotted into the module housing in which the inflator will be mounted later. The housing is provided with apertures corresponding to the positions of the hooks on the frame,and the frame is snap-fitted into the housing so that the hooks engage and are retained by the lower edges of resilient tongues above each aperture forming resilient latches. Preferably the lower edge of the frame fits into a channel along the upper edge of the housing. Under the stresses of deployment the airbag mounting flap is clamped between the frame and the housing and this further evens out the loads on deployment and takes strain off the hooks. Snap-fitting is a very fast and reliable assembly process. In addition there is the advantage that external inspection of the correct fitting of the frame into the housing is possible.

Part of the cushion end flap may be folded over the top of the frame and secured to the hooks on the other side of the frame, so as to provide a cover protecting the folded airbag cushion from dust and debris. This cover could have a perforated tear line for providing a deployment hole for the airbag.

One embodiment the airbag module is fitted with a short

inflator holes on one side only. A suitable inflator is the Advanced Passenger Hybrid (APH). Using an inflator shorter than the housing enables it to be mounted asymmetrically with the gas exit holes generally in the middle of the housing. Gas will therefore exit the inflator relatively symmetrically with respect to the housing thus deploying the airbag symmetrically while avoiding the added weight and expense of a manifold or having to adopt specific ratios or sizes for the inflator opening holes.

For a better understanding of the present invention and to show how the same may be carried into effect, reference will now be made to the accompanying drawings in which:

Figure 1a is a perspective view of a retainer frame according to the invention attached to an airbag housing and figure 1b is the same view of the housing without the frame.

Figure 2 is a cross-sectional view of the frame and housing of figure 1.

Figure 3 is an end view of the frame and housing of figure 1.

Figure 4 is a schematic cross-section of a frame according to the invention illustrating one way of folding an airbag cushion into the frame of the invention.

Figure 5 is a cross-sectional side view of the frame

and housing of figure 1 showing an inflator installed according to a second aspect of the invention.

In figure 1a a retainer frame 1, of generally rectangular shape is shown snap-fitted to an airbag inflator housing 2 by means of hooks 3 on the frame 1 interlocking with resilient latches 4 on the housing 2. A module mounting flange 5 secures the module into a vehicle by screws or bolts or rivets (not shown). In figure 1b the frame 1 is removed from the housing 2 and the latches 4 can be clearly shown as resilient inwardly bent tongues above apertures 14. When the frame 1 is inserted in the housing the hooks 3 bend the tongues outwardly and snap fit into the apertures 14 with the upper edges of the hooks resting against the lower edges of the tongues.

An inflator 6 (shown in figure 2) is secured to the interior of the housing 2, and an airbag cushion 7 (shown in figure 2) is folded on top of the inflator 6 in the region of frame 1.

Side panels or mounting flanges 10 of the cushion 7 are drawn under the lower edge 8 of the frame turned through 180° and about the outer side of the frame, fitting over the hooks 3.

The lower edge 8 of the frame 1 fits into a groove 9 on the upper edge of housing 2 and the frame hooks 3 snap into the housing latches 4 through the apertures to engage the tongues to retain the frame in locking engagement with the housing. The mounting flanges 10 are trapped between the

frame and the housing. An end panel of the airbag mounting flange forms a cover 11 and passes over the top of the frame 1 and is fastened to the hook 3 at the other side, so as to protect the airbag from dust and debris. A tear line 12 may be made in the fabric of the cover 11 to provide a line of weakness along which the cover 11 will split on deployment.

Figure 3 shows the latches 4 in more detail at one end of the housing 2. They are formed of vestigial flaps 13 when a U shaped hole 14 is moulded or machined in the side of the housing. In the embodiments illustrated the flap 13 is formed in a tapering region of the side so that it is effectively bent inwardly towards the frame and more efficiently engages the frame hooks which protrude through the apertures 14. The inflator 6 is mounted in the lower part of the housing 2.

Figure 4 shows an airbag cushion 7 in two side-by-side concertinas with the folds lying horizontally in the frame 1. Alternatively the cushion may be folded in other ways for example in a single concertina with the folds lying vertically in the frame. The airbag cushion end panel 11 is turned over the folded cushion 7 to form a dust cover and engages hooks 3 on each side of the frame. A tear seam is provided at 12.

Figure 5 shows the inflator 6, in side cross-section, mounted asymmetrically in the lower part of the housing 2, below airbag 7. Gas outlet holes 15 discharge inflation gas into the airbag 7 as shown, in a relatively symmetrical manner without a manifold.

CLAIMS

1 An airbag housing arrangement for securing an airbag cushion in an airbag housing, comprising a retainer frame having a plurality of externally jutting hooks spaced around its outer side or sides, adapted to hold peripheral edge portions of the airbag cushion, and furthermore at least some of the hooks being adapted for bending the airbag housing on assembly therewith and for snap-fit engagement in correspondingly spaced apertures in the sides of the airbag housing.

2. An arrangement according to claim 1 wherein the lower edges of the frame (viewed in the direction of deployment of the cushion) are rounded to present a smooth surface to the airbag fabric.

3. An arrangement according to claim 1 or 2 wherein the airbag cushion fabric, in the region of the mounting flap, abuts the inside surface of the frame, turns through 180° as it passes under the edge of the frame and abuts the outer surface of the frame, at least up to the position of its engagement with the hook or hooks.

4. An arrangement according to any preceding claim wherein the frame and housing are made to fit tightly together to clamp the cushion fabric.

5. An arrangement according to any one of claims 1 to 3 wherein a small clearance is built in between the frame and the housing to allow for manufacturing tolerances.

6. An arrangement according to any preceding claim wherein the frame and the housing are cast or moulded out of magnesium or aluminium or alloys thereof.

7. An arrangement according to claims 1 to 5 wherein the frame and the housing are formed by plastic moulding.

8. An arrangement according to any preceding claim wherein at least ten hooks are used.

9. An arrangement according to any preceding claim wherein the hooks engage and are retained by the lower edges of resilient tongues above each aperture forming resilient latches.

10. An arrangement according to any preceding claim wherein the lower edge of the frame fits into a channel along the upper edge of the housing.

11. An arrangement according to any preceding claim wherein a part of the cushion end flap is folded over the top of the frame and secured to the hooks on the other side of the frame, so as to provide a cover protecting the folded airbag cushion.

12. An arrangement according to any preceding claim wherein the cover has a perforated tear line for providing a deployment hole for the airbag.

13. An arrangement according to any preceding claim comprising an inflator shorter than the housing so that it

can be mounted asymmetrically with the gas exit holes generally in the middle of the housing.

14. An arrangement substitute as hereinbefore describe with reference to the accompanying drawings.

The Patent Office

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Application No: GB 9804729.3
Claims searched: 1 to 13

Examiner: Karl Whitfield
Date of search: 26 July 1998

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.P): B7B (BSBCM, BSBCR)

Int Cl (Ed.6): B60R 21/16, 21/20

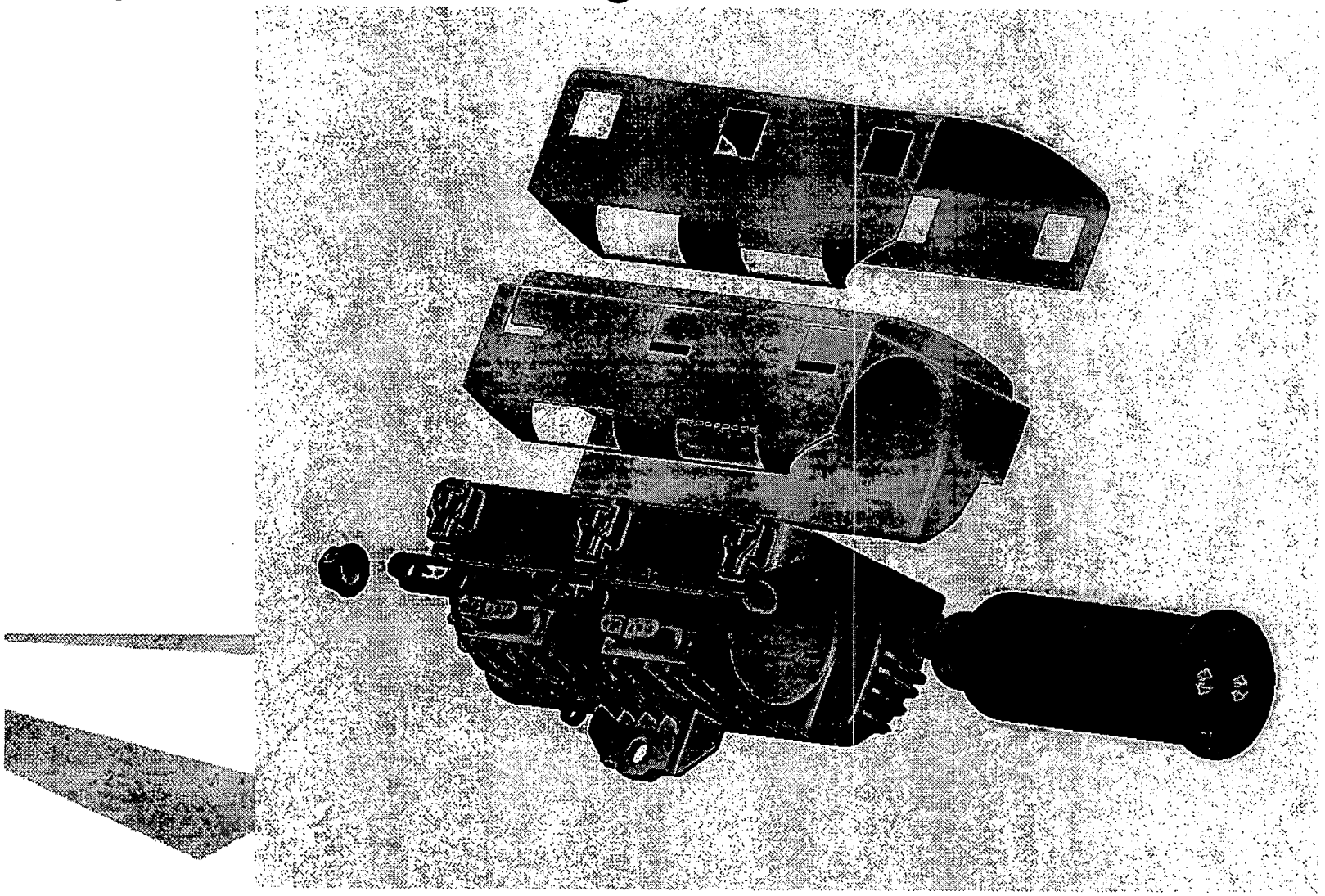
Other: Online database: Derwent World Patents Index accessed via Questel

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X, E	GB 2318101 A	(ALLIEDSIGNAL) especially figure 3	1 at least
X	US 5409256	(GORDON et al.) especially figure 3	1 at least
X	US 5354093	(SCHENCK et al.) especially figure 5	1 at least
X	US 5320379	(BURNARD et al.) especially figure 2	1 at least

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Opel Plastic Housing Version 1



Opel Plastic Housing Version 2